

14082 - 62.63 grams
14083 - 13.37 grams
Light matrix Breccia



Figure 1: Photo of "white boulder" from boulder field at rim of Cone Crater. 14082-83 was chipped from the top center of this boulder. AS14-68-9453.

Introduction

On the rim of Cone Crater there were two obvious lithologies (white and dark)(figure 1). However, the astronauts only collected two small samples of the white lithology (Swann et al. 1977) and this important lithology remains under-represented in the collection. One was the pair 14082-14083; the other 14063-14064.

14082 is a blocky to slightly slabby, angular rock with a very rough surface. Glass-lined zap pits are very sparsely distributed over one surface. There are no fractures. The sample is a very friable, fine-grained clastic rock with a few percent of subrounded dark clasts in a very light gray matrix. Clasts are locally concentrated at one end of 14083.



Figure 2a: Photo of 14082. S71-32443. Sample is 5.5 cm across.



Figure 2b: Photo of 14083. S71-25213. Sample is 3.5 cm across.

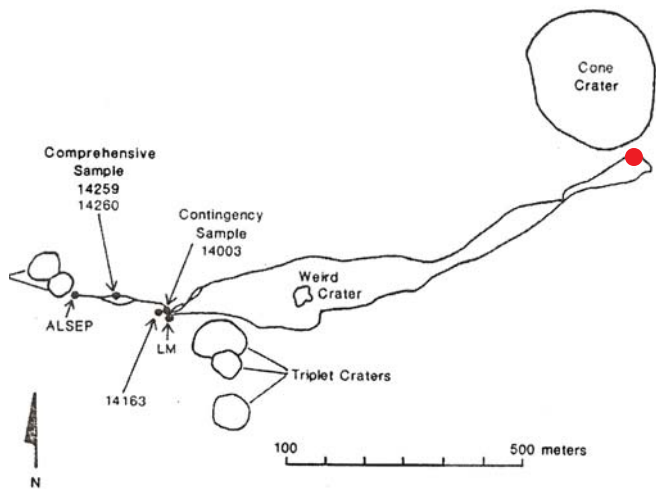


Figure 3: Map of Apollo 14 traverse to Cone Crater.

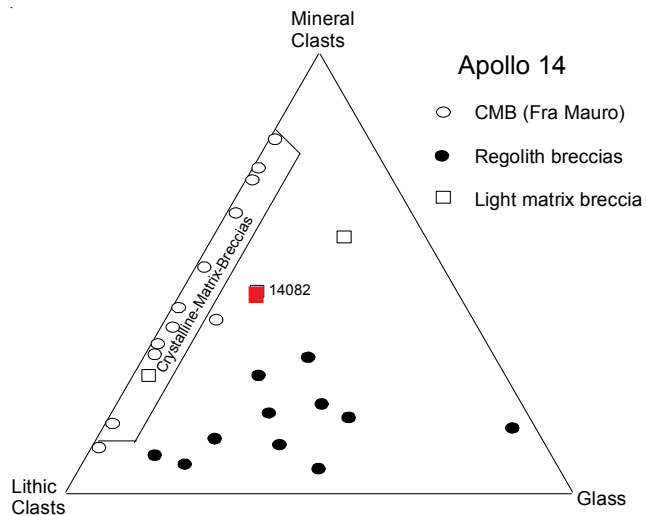


Figure 4: Simonds diagram for Apollo 14 breccias.

The light matrix breccias seem to have relatively low meteoritic siderophiles compared with the dark matrix breccias. There is no age data for these samples.

Petrography

McGee et al. (1977) describe 14082 as a light-matrix breccia with a relatively well-mixed matrix, although they found some sections consist of monomict zones. The matrix is porous and characterized by a seriate texture, with material ranging from the limit of resolution up to about 300 microns. The mineral clasts are plagioclase, pyroxene, olivine, ilmenite and colorless-glass. Plagioclase (An_{70-96}) is largest and most abundant and only rarely shows undulatory extinction. Olivine and pyroxene are subrounded and less than 300 microns. Papike and Bence (1972) reported inverted pigeonites indicating slow-cooled plutonic origin.

Ilmenite, Mg-spinel and metallic iron are found as small grains in the matrix.

The lithic clast population is dominated by poikilitic-textured impactites which contain plagioclase laths enclosed in pyroxene oikocrysts together with clasts of angular plagioclase. Several clasts of high-Al basalt were described by Ryder and Bower (1976). Clasts of vitric-matrix breccia are also found.

Mineralogical Mode for 14082

	von Engelhardt 1972	Simonds et al. 1977
Matrix	26 %	71
Plagioclase	42	10.5
Pyroxene	28	2
Opaque	3	tr
Glass	1	
Microbreccia		10.5
Granulitic		1.5
Felds basalt		3

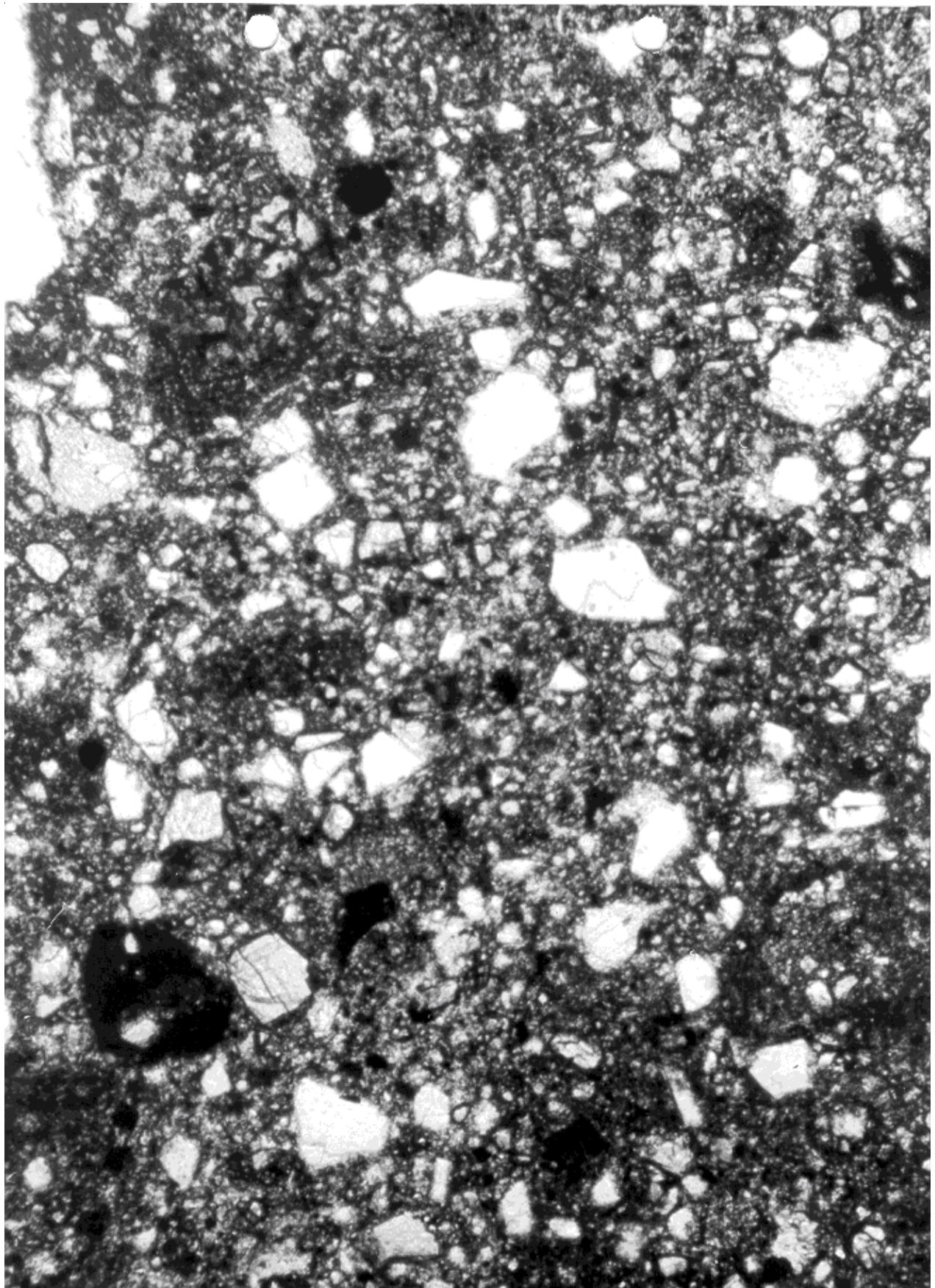


Figure 5: Photomicrograph of thin section 14082,7. NASA S71-25480.

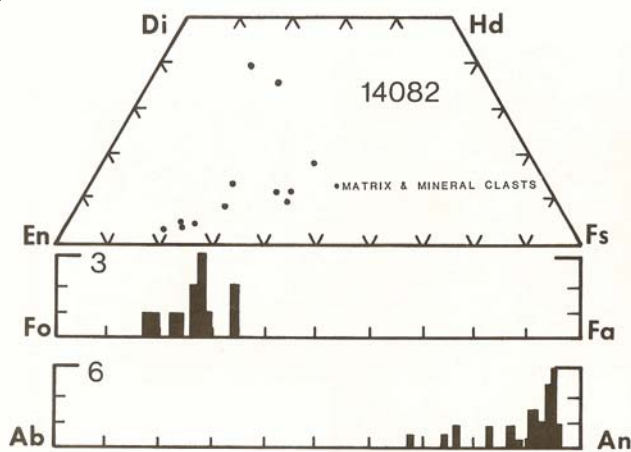


Figure 6: Pyroxene, olivine and plagioclase composition for 14082 (from McGee et al. 1977)..

14082 was studied by the Imbrium Consortium led by John Wood. The consortium study of 14083 was led by Gerry Wasserburg.

Chemistry

14082 is more Al-rich and less Fe-rich than other Apollo 14 breccia samples. These samples appear to have relatively low content of meteoritic siderophiles.

Radiogenic age dating

none

Cosmogenic isotopes and exposure ages

14082/3 was sitting on top of a boulder, completely exposed to cosmic rays and micrometeorites. It was found to have ^{26}Al activity of 120 dpm/kg, ^{22}Na = 53 dpm/kg, ^{54}Mn = 6 dpm/kg and ^{56}Co = 34 dpm/kg (Keith et al. 1972).

Other Studies

Drozd et al. (1976) reported the Xe isotopes and showed there was a lack of excess fission Xe.

Dran et al. (1972) studied the cosmic ray and solar flare tracks.

Processing

14082/3 was collected in bag 13N, which was returned in ALSRC 1006, which was sealed. There are 17 thin sections for 14082 and 4 thin sections for 14083.

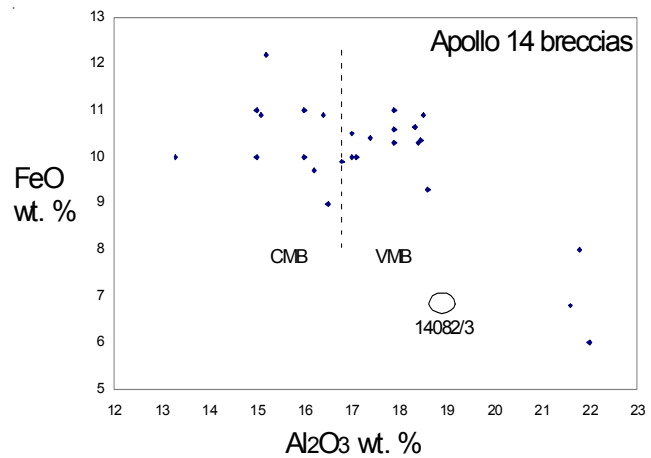


Figure 7: Composition of 14082-3 compared with other Apollo 14 breccias.

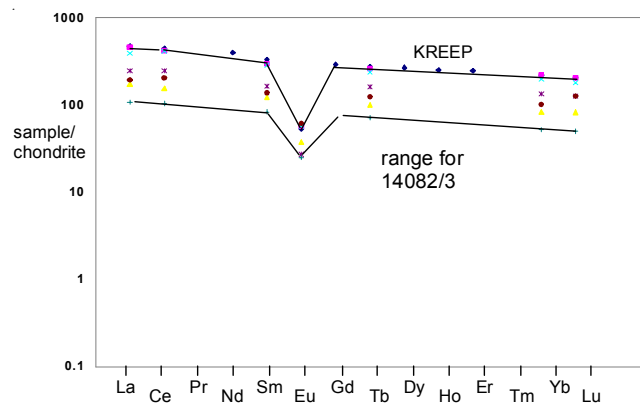


Figure 8: Normalized rare-earth-element diagram for 14082, compared with KREEP.

Table 1. Chemical composition of 14082/83.

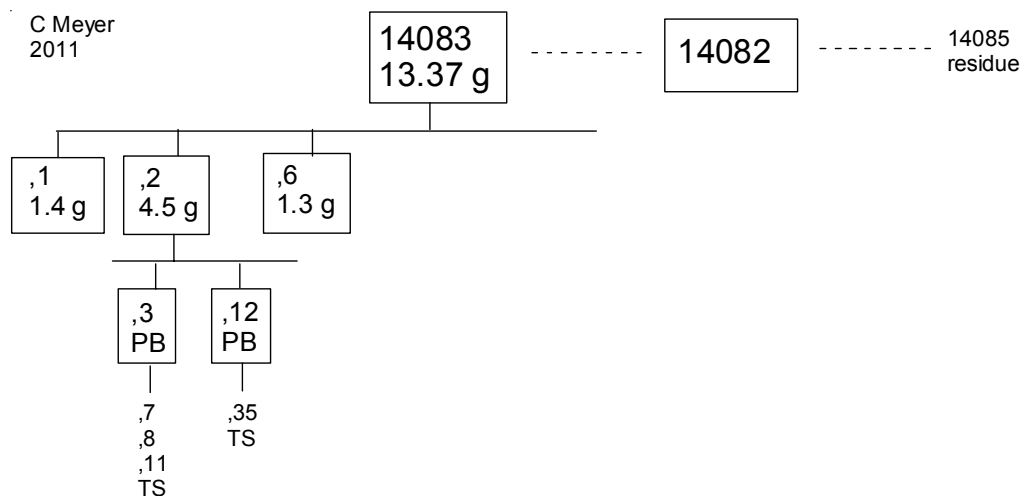
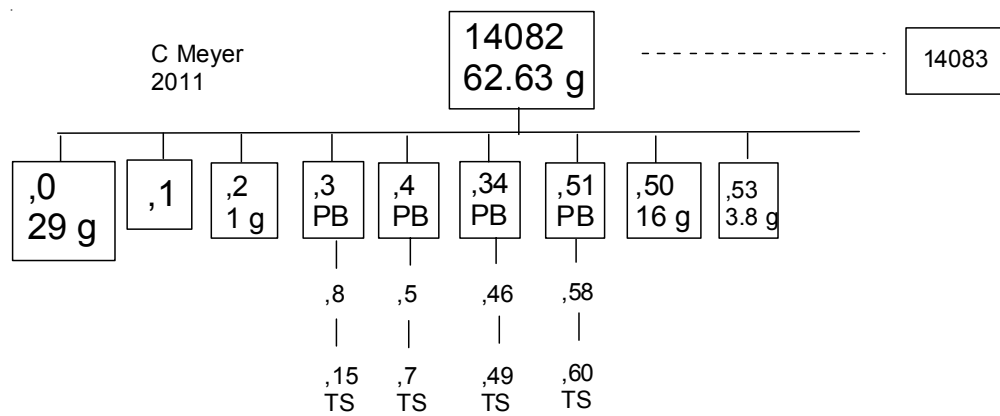
reference weight	Ebihara93	Rose 72 dark clast	light clast	Ryder80 clast	Keith72 63 g	Laul72 73 mg	white	dark	Gros 76
SiO2 %		46.19	44.2	(b) 44					
TiO2		2.21	0.8	(b) 6		1.6	0.72	1.7	(d)
Al2O3		17.16	22.06	(b) 11.4		16.4	21.8	17	(d)
FeO		9.66	7.16	(b) 11.8		10.4	6.8	9.1	(d)
MnO		0.11	0.06	(b)		0.116	0.076	0.11	(d)
MgO		11.55	11.48	(b) 8.2					
CaO		10.76	12.66	(b) 13.2		10.4	14.1	12.4	(d)
Na2O		1.01	0.65	(b) 0.7		0.984	0.657	0.973	(d)
K2O		0.4	0.23	(b) 0.1	0.25	(c) 0.36	0.21	0.44	(d)
P2O5		0.63	0.44	(b) 0.01					
S %									
sum									
Sc ppm		23	12	(b)		21.5	10.1	19.2	(d)
V		44	31	(b)		45	25	48	(d)
Cr		1436	960	(b) 1400		1231			(d)
Co		25	17	(b)		34	17	26	(d)
Ni	133	(a) 180	73	(b)					64 (a)
Cu		11	6	(b)					
Zn	3.81	(a) 4	4	(b)					3.2 (a)
Ga		4.4	4.6	(b)					
Ge ppb	51.7	(a)							36.2 (a)
As									
Se	5.73	(a)							5.5 (a)
Rb	29.8	(a) 8.8	5.2	(b)					13.4 (a)
Sr		140	160	(b)					
Y		300	190	(b)					
Zr		800	380	(b)		830	450	1100	(d)
Nb		56	26	(b)					
Mo									
Ru									
Rh									
Pd ppb	0.53	(a)							0.4 (a)
Ag ppb	1	(a)							0.64 (a)
Cd ppb	3.75	(a)							10.8 (a)
In ppb	12	(a)							4.14 (a)
Sn ppb									
Sb ppb	2.9	(a)							0.4 (a)
Te ppb	2.37	(a)							0.15 (a)
Cs ppm	0.378	(a)							0.295 (a)
Ba		940	500	(b)		900	450	1100	(d)
La		97	61	(b)		109	41	92	(d)
Ce						253	94	249	(d)
Pr									
Nd									
Sm						44	18	42	(d)
Eu						3.2	2.1	3.2	(d)
Gd									
Tb						9.4	3.6	8.6	(d)
Dy									
Ho									
Er									
Tm									
Yb		31	16	(b)		36	13.4	32	(d)
Lu						5	2	4.4	(d)
Hf						31	13	31	(d)
Ta						3.7	1.3	3.5	(d)
W ppb									
Re ppb	0.047	(a)							0.062 (a)
Os ppb	0.931	(a)							0.921 (a)
Ir ppb	0.761	(a)							0.834 (a)
Pt ppb									
Au ppb	0.252	(a)							0.562 (a)
Th ppm					4.2	(c) 19	6.1	19	(d)
U ppm	1.335	(a)			1.24	(c) 5	1.6	4.5	(d) 1.88 (a)

technique: (a) RNAA, (b) "microchemical", (c) radiation counting, (d) INAA

Table 2. Chemical composition of 14082 (cont.).

reference weight	Blanchard in Imbrium Consortium (unpublished)				Ryder76					
					matrix					
SiO ₂ %					49.9	48.6	47.2	48.4	45.6	(e)
TiO ₂					1.04	1.34	3.6	0.81	1.37	(e)
Al ₂ O ₃					19.6	20	15.8	20.9	22.4	(e)
FeO	6.4	6.39	12	(d)	5.1	6.5	9.3	6.2	6.5	(e)
MnO					0.09	0.09	0.15	0.07	0.05	(e)
MgO					5	6.3	8.4	7	6.3	(e)
CaO					11.7	11.7	9.7	11.7	13.7	(e)
Na ₂ O	1.1	1.39	0.59	(d)	0.87	0.97	0.69	0.89	0.87	(e)
K ₂ O					1.53	1.16	1.54	1.22	0.55	(e)
P ₂ O ₅					0.41	0.4	0.37	0.27	0.29	(e)
S %										
sum										
Sc ppm	12.1	14.8	38.9	(d)						
V										
Cr	740	690	1950	(d)						
Co	13	13	19	(d)						
Ni		120		(d)						
Cu										
Zn										
Ga										
Ge ppb										
As										
Se										
Rb										
Sr										
Y										
Zr										
Nb										
Mo										
Ru										
Rh										
Pd ppb										
Ag ppb										
Cd ppb										
In ppb										
Sn ppb										
Sb ppb										
Te ppb										
Cs ppm										
Ba										
La	58	45.6	25.2	(d)						
Ce	149	124	63	(d)						
Pr										
Nd										
Sm	24.8	20.4	12.3	(d)						
Eu	1.52	3.49	1.4	(d)						
Gd										
Tb	5.9	4.5	2.6	(d)						
Dy										
Ho										
Er										
Tm										
Yb	22	16.5	8.5	(d)						
Lu	3.06	2.36	1.22	(d)						
Hf	21	19	6.1	(d)						
Ta	3.6	2.9	0.8	(d)						
W ppb										
Re ppb										
Os ppb										
Ir ppb										
Pt ppb										
Au ppb										
Th ppm	14.3	9.1	2.4	(d)						
U ppm										

technique: (d) INAA, (e) defocused beam analysis



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